5.3.2 DETENTION TANKS

Detention tanks are underground storage facilities typically constructed with large diameter corrugated metal pipe. Standard detention tank details are shown in Figure 5.3.2.A (p. 5-33) and Figure 5.3.2.B (p. 5-34). Control structure details are shown in Section 5.3.4 beginning on page 5-38.

5.3.2.1 DESIGN CRITERIA

General

1. Tanks shall be designed as **flow-through systems with manholes in line** (see Figure 5.3.2.A, p. 5-33) to promote sediment removal and facilitate maintenance.

   Exception: Tanks may be designed as **back-up systems** if preceded by water quality facilities since little sediment should reach the inlet/control structure and low head losses can be expected because of the proximity of the inlet/control structure to the tank.

2. The detention tank bottom shall be located 0.5 feet below the inlet and outlet to provide dead storage for sediment.

3. The **minimum pipe diameter** allowed for a detention tank is 36 inches.

4. Tanks larger than 36 inches may be connected to each adjoining structure with a short section (2-foot maximum length) of 36-inch minimum diameter pipe.

5. Outflow **control structures** shall be as detailed in Section 5.3.4 (p. 5-38). *Note: Control and access manholes shall have additional ladder rungs to allow ready access to all tank access pipes when the catch basin sump is filled with water (see Figure 5.3.4.A, plan view, p. 5-40).*

Materials

Pipe material, joints, and protective treatment for tanks shall be in accordance with Sections 7.04 and 9.05 of the *WSDOT/APWA Standard Specification* as modified by the *King County Road Standards* and AASHTO designations. Such materials include the following:

- Lined corrugated polyethylene pipe (LCPE)
- Aluminized Type 2 corrugated steel pipe and pipe arch (meets AASHTO designations M274 and M36)
- Corrugated or spiral rib aluminum pipe and pipe arch
- Reinforced concrete pipe
- Narrow concrete vaults (see Section 5.3.3, p. 5-35).
- Corrugated steel pipe and pipe arch, Aluminized or Galvanized[8] with treatments 1 through 6
- Spiral rib steel pipe, Aluminized or Galvanized with treatments 1 through 6
- Structural plate pipe and pipe arch, Aluminized or Galvanized with treatments 1 through 6

Structural Stability

Tanks shall meet structural requirements for overburden support and traffic loading if appropriate. H-20 live loads must be accommodated for tanks lying under parking areas and access roads. The *King County Roads Standards* may have different live load requirements for structures located under roadways. Metal

[8] Galvanized metals leach zinc into the environment, especially in standing water situations. High zinc concentrations, sometimes in the range that can be toxic to aquatic life, have been observed in the region. Therefore, use of galvanized materials should be avoided. Where other metals, such as aluminum or stainless steel, or plastics are available, they shall be used. If these materials are not available, asphalt coated galvanized materials may then be used.

tank end plates must be designed for structural stability at maximum hydrostatic loading conditions. Flat end plates generally require thicker gage material than the pipe and/or require reinforcing ribs.

Tanks shall be placed on stable, well consolidated native material with a suitable bedding. Backfill shall be placed and compacted in accordance with the pipe specifications in Chapter 4. Tanks made of LCPE require inspection for deformation prior to installation as well as continuous inspection of backfilling to one foot above the top of the tank. Tanks shall not be allowed in fill slopes, unless analyzed in a geotechnical report for stability and constructability.

Buoyancy

In moderately pervious soils where seasonal groundwater may induce flotation, buoyancy tendencies must be balanced either by ballasting with backfill or concrete backfill, providing concrete anchors, increasing the total weight, or providing subsurface drains to permanently lower the groundwater table. Calculations must be submitted that demonstrate stability.

Access Requirements

1. The **maximum depth** from finished grade to tank invert shall be 20 feet.
2. **Access openings** shall be positioned a maximum of 50 feet from any location within the tank.
3. All tank access openings shall have round, solid **locking lids** with $^{5}/_{8}$-inch diameter Allen head cap screws (see *KCRS* Drawing No. 2-022 and 2-023).
4. Thirty-six-inch minimum diameter **CMP riser-type manholes** (Figure 5.3.2.B, p. 5-34) of the same gage as the tank material may be used for access along the length of the tank and at the upstream terminus of the tank if a backup system. The top slab is separated (1-inch minimum gap) from the top of the riser to allow for deflections from vehicle loadings without damaging the riser tank.
5. All tank access openings must be readily **accessible by maintenance vehicles**.

Access Roads

Access roads are required to all detention tank control structures and risers. The access roads shall be designed and constructed **as specified for detention ponds** in Section 5.3.1 (p. 5-20).

Right-of-Way

Detention tanks to be maintained by King County but not located in King County right-of-way shall be in a tract dedicated to King County. Any tract not abutting public right-of-way will require a 15-foot wide extension of the tract to accommodate an access road to the facility.

Setbacks

Setbacks (easement/tract width) and building setback lines (BSBLs) for tanks shall be the same as for pipes (see Section 4.1).

5.3.2.2 METHODS OF ANALYSIS

Detention Volume and Outflow

The volume and outflow design for **detention tanks** shall be in accordance with the performance requirements in Chapter 1 and the hydrologic analysis and design methods in Chapter 3. Restrictor and orifice design shall be according to Section 5.3.4 (p. 5-38).